ance to the body and destroying the evenness of its surface owing to the difference in light-reflecting power between hairs of these hues to which domestic horses bear witness. Moreover, the extension of the stripes to the very edge of the body and legs breaks up the continuity of the outline, and this, I believe, is the reason for the alteration in their direction on the hind-quarters and limbs, so that, except on the forehead, the whole animal is barred transversely with reference to its spinal and appendicular axes.

We have also the positive assurance of observers that the asses of the deserts of North-East Africa are perfectly adapted to their surroundings in colour, and no one can doubt that the assimilation is equally perfect in the case of the kiang and Prjevalsky's ponies[1] of Central Asia. In the matter of colouring the kiang forcibly recalls the typical quagga, despite a decided difference in the deepness of the brown pervading the upper parts in the two species. Notwithstanding this difference, there can, I think, be no question that the explanation to be given of the significance of the colours of the kiang applies with equal truth to the quagga. This explanation is the hypothesis of the counteraction of light and shade put forward by the American artist, Thayer.

It would be hard to find a better and simpler instance of this style of coloration than the kiang. The upper parts on which the light falls are of a rich ruddy hue, darker than ordinary sand, while the muzzle, the lower side of the head, the throat and the belly are creamy white. Surely no one with a knowledge of the truth enunciated by Thayer will

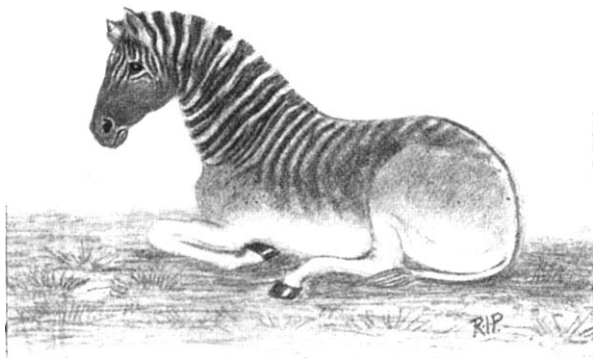

FIG. 1.—Gray's Quagga lying, to show the unbroken continuity of the white on the underside.

dispute that the arrangement and nature of the colours in the kiang must render it practically invisible when standing in the desert at a distance. But this is not all. Why are the legs, or at least the greater part of them, and the backs of the thighs up to the root of the tail also white? This is doubtless the reason. When the kiang rests on the ground in the attitude characteristic of ungulates, with the hind-quarters depressed, the fore-legs folded and the hind-legs tucked in close to the body, the white on the back of the thighs is brought into line with that of the belly, and a continuous expanse of white, obliterating the shadow, extends all along the underside from the knee to the root of the tail. So, too, with the quagga. This, then, is the meaning of the change in pattern presented by the African species as it passed southwards into Cape Colony. In correlation with the adoption of a life in the open, a new method of concealment by means of shadow counteraction was required, and was gradually perfected by the toning down of the stripes on the upper side and the suppression of those on the hind-quarters, belly and legs.

The same alignment of the white on the rump and belly may be seen in many antelopes, like gazelles, and the co-operation of the legs in increasing the underlying area of white is especially well shown in the bonte-bok.

Now the rump-patches, be it noted, only subserve the purpose here suggested when the animals that possess them are lying on the ground. This, however, is the time, as they drowsily rest or chew the cud, when concealment is of the greatest importance to ungulates, which are, for the most part, clumsy risers, and slow at getting under way. When standing and on the alert, their need for concealment, though seldom absent, is certainly less, and when they are on the run all idea of it is thrown to the winds. It is then that the rump-patches act, as Mr. Wallace suggested, as danger signals and "follow-the-leader" marks, showing the young and inexperienced which way to go, and helping the members of a herd to foregather in the dark when dispersed by the panic of a night attack.

The pattern of a zebra, in its entirety, is also believed by Mr. Wallace to have a double significance analogous to the above. It is known to be procryptic; but he holds that it acts as a badge of recognition, enabling the zebras to distinguish their own kind amongst the herds of other beasts that may be feeding in the same place. It may be so; for although seemingly contradictory, the two explanations are not mutually exclusive. The procryptic effect of the pattern is largely a matter of distance and light. At close quarters in broad daylight a zebra is conspicuous unless under cover, and the colouring is strikingly unlike that of other animals. On the other hand, it must be remembered, as I have elsewhere pointed out (NATURE, October 11, 1900), that the species, like wildebeests, zebras, spring-buck, or even ostriches, which formerly at all events fed together upon the veldt,[1] are so dissimilar in size and shape that the need for a distinctive type of coloration to prevent the postulated likelihood of specific confusion can hardly have been a sufficiently important factor in survival to have guided the evolution of the colour for the purpose supposed. And since we have evidence of the best kind that the pattern of zebras and quaggas is procryptic, it seems unnecessary to look further for its explanation.

R. I. POCOCK.

[1] A suspicious inconstancy about their coloration inclines me to the opinion that these ponies are the descendants of "runaways."

AGRICULTURAL NOTES.

IN the recently published number of the *Journal* of the South-eastern Agricultural College, Wye, Mr. Theobald gives an account of some injurious flea-beetles (Halticæ) which he has recently studied. He finds that the damage ascribed to the turnip "fly" (*Phyllotreta nemorum*) is very often due to related genera. A troublesome attack of the "fly" at the College farm drew attention to a new culprit, *Haltica oleracea*, and in observations made in Yorkshire, Cambridge, Huntingdon, Surrey, Kent and Devon, this species was found to be much more destructive than *P. nemorum*. The characteristics of five injurious genera are described, and observers are asked to collect and report upon these very destructive insects. Mr. Theobald's experience leads him to remark that "The present economic entomologist relies on the past economic entomologist, and so errors go on until they really seem facts. . . . John Curtis wrote the most excellent article on the turnip flea that can be imagined, and we have all copied it." Mr. Theobald's request for "serious reporting and collecting" should appeal to a wider circle than is reached by the College *Journal*. The entomologist is not the only worker who relies on the achievements of the past, nor is economic entomology the only branch of applied science that may learn something from this study of the Halticæ.

In the same number Principal Hall, until recently head of the College, summarises the results of manurial experiments on the hop, which have been carried on at various centres for from three to eight years. He concludes that the hop plant is "an all-round feeder," in this respect differing from such crops as swedes, which depend mainly on phosphates, and from potatoes, which must be liberally dressed with potassic manures. No one special manure can

[1] These odd friendships are a great puzzle; but perhaps the following suggestions may throw some light upon their occurrence and use. It is unlikely in the extreme that all the species concerned have their sense organs developed to an equal pitch of excellence. In one the sense of smell, in another the sense of sight, in a third the sense of hearing will be pre-eminently keen. Hence the sensory imperfections of one species will be made good by the proficiencies of the others; and each will be benefited by the association. Ostriches, for instance, in virtue of their stature and long sight, will see an enemy in open country at a much greater distance than will zebras or gnus, and will give the alarm by starting to run. Zebras, on the other hand, will scent a lion creeping up under cover long before the ostriches will see him; and by making off will warn these birds and other duller scented members of the incongruous assemblage that danger is afoot.

be recommended to hop-growers; the first point in successful management must be to ascertain and make good the manurial deficiencies of the particular soil. In some cases phosphates, and in others potash, may be found profitable as an addition to a dressing of a nitrogenous manure. Specific instructions are given for the manuring of the Farnham hop soils.

To part i. vol. v. of the *Journal* of the Khedivial Agricultural Society, one of the editors, Mr. E. P. Foaden, contributes an article on "Manures in use in Egypt." With the rapid advances made in the material welfare of the country, and the increased use of irrigation, there has been "an extraordinary increase in the value of land," and the subject of suitable manures for use in intensive cultivation is a pressing one. Nile mud, upon which the cultivators have so largely depended in the past, has been proved by experience to be insufficient, and by analysis to lack nitrogen, though supplying an abundance of potash for most, and of phosphate for many, crops. The supply of farmyard manure is very inadequate. In Egypt as in India, the lack of wood leads to the use of dried cow-dung cakes for fuel. Pigeon manure forms a concentrated fertiliser extensively used in Upper Egypt, and dried sewage is becoming popular. Two interesting natural products are mentioned; one, *Coufri*, is a manure collected on ancient village sites, but it is of low quality, seldom containing more than 0·5 per cent. of nitrogen; the other, known as *Marog* or *Tafia*, is a blue clay or a marl found in hills in the deserts in Upper Egypt. This is an important manure in common use in parts of Upper Egypt, and of great value to the country. Analyses of seven samples are quoted, and these show that *Marog* contains notable quantities (from 2·5 to 24 per cent.) of nitrate of soda, associated with which is common salt. The percentage of salt in the analyses quoted varies from 6·8 to 21·5, but there is no constant relation between the salt and nitrate of soda. It is suggested that *Marog* might be treated so as to yield commercial nitrate of soda. In its present crude form the heavy cost of transport prevents the use of *Marog* in Lower Egypt. The article deals briefly with common artificial manures such as nitrate of soda, sulphate of ammonia and superphosphate, all of which are now being imported into Egypt for application to cotton, sugar-cane, and the more valuable cereal and market-garden crops.

When the "Sale of Milk Regulations" came into force in September, 1901, the standard of 3 per cent. fat and 8·5 per cent. non-fatty solids required by the Board of Agriculture was regarded as being very low, and the opinion was freely expressed that the milk of well-fed, healthy cows was rarely so poor in quality. It has since been shown that milk is more variable in composition than was formerly supposed, and that a sample representing a single milking may frequently contain a smaller percentage of solids than is required by the Board's regulations. When milk is drawn at equal intervals, the mixed milk of a herd of cows will usually be satisfactory, but if the milk of the individual cows be tested, it will be found to show wide, and at present inexplicable, variations. On this question some experiments have recently been made by Messrs. Dymond and Bull at Chelmsford, under the auspices of the Essex Technical Instruction Committee. The experiment consisted in testing, twice daily, the milk of six shorthorn cows which were housed, fed and milked under careful supervision and under favourable conditions. Two of the cows were under observation for short periods only. The following figures show the number of times on which the milk of the others failed to reach the standard:—

	Average daily yield lbs.	No. of milk analyses	Fat deficient	Non-fatty solids deficient
Cow I.	30·8	206	8 times	68 times
,, II.	28 8	206	117 ,,	52 ,,
,, III.	16·6	156	1 ,,	0 ,,
,, IV.	18·8	206	0 ,,	0 ,,

The first two animals were in full milk, having calved six weeks before the test began; the other cows had calved eight months, and were beginning to go dry. The feeding was varied in the course of the experiments, and on several occasions the animals were exposed to low temperatures, but the milk was little, if at all, influenced. The quality depended on the cow, not on the conditions under which she was kept. The mixed milk did not fall below standard during the experiments, but the analyses given indicate that when a herd is largely composed of newly-calved cows the milk *may* frequently fall below standard.

An illustrated article in a recent number of the *Scientific American* describes scientific poultry raising as practised on the largest poultry farm in the States (at Sidney, Ohio). On this farm 3000 Leghorns supply on an average 200 dozen unfertile eggs for culinary purposes *per diem*, and 900 Plymouth Rocks produce 450 eggs daily, which the hatchery—a building 480 feet long—converts into 300 healthy chicks. The chicks, when a day old, pass to the "nursery," and spend a month in this building, which is capable of holding 6000 at a time. They then pass to a second building, where they remain until three months old. The chickens are not allowed to mix, but are divided up into small colonies, so that if anything goes wrong the mischief is prevented from spreading. The hens are provided with automatic nests, so constructed that the egg is removed as soon as it is laid; the new-laid eggs are thus collected at once, and are washed, dated, and placed in refrigerators for transport, so that they reach their destination absolutely fresh. Electric light is employed in the testing of eggs, and the progressive poultryman, assisted by the researches of the U.S. Department of Agriculture, feeds his fowls on the most approved principles. The net result of science in the poultry yard is a "marvellous development of the incubator industry" and of the poultry business. It is stated that one town in Illinois turns out more than 50,000 incubators a year. Among leading poultry farms are mentioned those of ex-President Cleveland and of President Diaz, of Mexico.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE Royal Commissioners for the Exhibition of 1851 have made the following appointments to science research scholarships for the year 1903, on the recommendation of the authorities of the several universities and colleges. The scholarships are of the value of 150*l*. a year, and are ordinarily tenable for two years (subject to a satisfactory report at the end of the first year) in any university at home or abroad, or in some other institution approved of by the Commissioners. The scholars are to devote themselves exclusively to study and research in some branch of science, the extension of which is important to the industries of the country. The nominating institutions and the scholars are as follows:—University of Glasgow, A. W. Stewart; University of St. Andrews, D. McLaren Paul; University of Birmingham, N. L. Gebhard; Yorkshire College, Leeds, R. Gaunt; University College, Liverpool, J. F. Spencer; University College, London, H. Bassett; Owens College, Manchester, L. Bradshaw; Durham College of Science, T. P. Black; University College, Nottingham, G. Tattersall; University College, Sheffield, Catherine Radford; University College of North Wales, Bangor, K. J. Thompson; Royal College of Science, Dublin, S. A. Edmonds; Queen's College, Belfast, T. B. Vinycombe; McGill University, Montreal, H. L. Cooke; University of Sydney, A. Boyd. The following scholarships granted in 1902 have been continued for a second year on receipt of a satisfactory report of work done during the first year:—University of Edinburgh, J. K. H. Inglis; University of Glasgow, A. Wood; University of Aberdeen, A. C. Michie; University of Birmingham, J. A. Lloyd; Yorkshire College, Leeds, H. D. Dakin; University College, Liverpool, F. Rogers; University College, London, E. P. Harrison; Owens College, Manchester, G. C. Simpson; Durham College of Science, C. R. Dow; University College, Sheffield, G. B. Waterhouse; Queen's College, Galway, W. Goodwin; University of Toronto, W. C. Bray; Dalhousie College, Halifax, Nova Scotia, T. C. Hebb; University of Melbourne, R Hosking; University of New Zealand, M. A. Hunter. The following scholarships granted in 1901 have been exceptionally renewed for a third year:—Yorkshire College, Leeds, R. B. Denison; University College, London, G. Owen; University College of London, Dr. G. Senter; University College of North Wales, Bangor, Alice